Agreement on the Conservation of Albatrosses and Petrels

First Meeting of the Population and Conservation Status Working Group

La Rochelle, France, 29 – 30 April 2013

An assessment of the population trends and conservation status of Black-browed Albatrosses in the Falkland Islands

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SUMMARY

The most recent censuses of Black-browed Albatrosses breeding at the Falkland Islands were conducted in 2010. Aerial and ground-based surveys have been used independently to census the Falkland Islands' population. Previously these census initiatives reported contrasting population trends. The aerial based surveys indicated an increase in the population between 1986 and 2005 and the ground-based surveys a decline between 2000 and 2005, and using historical data an inferred decline between 1995 and 2005. The aerial and ground-based surveys conducted in 2010 both revealed an increase in the Black-browed Albatross population of at least 4% per annum between 2005 and 2010. Although there are survey-specific differences in the population estimates and the percentage change patterns, the positive trend from both these surveys is supported by demographic data and an additional aerial photographic survey conducted later in the 2010 breeding season. The results from the 2010 ground-based survey indicate that the population has also increased since the first archipelago-wide ground survey in 2000, and possibly even since the initial ground based surveys were conducted at Beauchêne and Steeple Jason islands in the 1980s. Current estimates for the annual breeding population in the Falklands range between 475, 500 and 535,000 pairs. The exact reasons for the increase are not entirely clear, but efforts to reduce seabird bycatch, and favourable feeding conditions, are likely to have contributed. The Falkland Islands support ca. 70% of the global population of Black-browed Albatrosses, and the results reported here are in the process of being used to re-assess the global conservation status of the species, currently classified as *Endangered*. Notwithstanding the current status of the Falkland Islands' population, efforts should continue to further improve seabird bycatch mitigation, both to buffer the local population against possible future changes, and to improve the conservation status of other populations and species.

RECOMMENDATION

To note the results presented, and make use of them in future assessments conducted for Black-browed Albatrosses.

Evaluación de las tendencias de la población y el estado de conservación de Albatros de ceja negra en las Islas Malvinas

Los censos más recientes de los albatros de ceja negra que se reproducen en las Islas Malvinas se realizaron en 2010. Se han usado los sondeos aéreos y terrestres en forma independiente para censar la población de las Islas Malvinas. Previamente, estas iniciativas de censo informaron tendencias de población opuestas. Los sondeos aéreos indicaron un aumento de la población entre 1986 y 2005, y los sondeos terrestres una reducción entre 2000 y 2005, y mediante el uso de datos históricos una reducción inferida entre 1995 y 2005. Los sondeos aéreos y terrestres llevados a cabo en 2010 revelaron, en ambos casos, un aumento de la población de albatros de ceja negra de, al menos, el 4% anual entre 2005 y 2010. Si bien se observaron diferencias específicas de los sondeos en las estimaciones de la población y los patrones de cambio de los porcentajes, la tendencia positiva de ambos sondeos está respaldada por los datos demográficos y un sondeo fotográfico aéreo adicional que se llevó a cabo más adelante en la temporada de reproducción 2010. Los resultados del sondeo terrestre realizado en 2010 indican que la población también aumentó desde el primer sondeo terrestre de todo el archipiélago realizado en 2000, y posiblemente incluso desde que se realizaron los sondeos terrestres iniciales en las islas Beauchêne y Steeple Jason en la década de 1980. Las estimaciones actuales para la población reproductiva anual en las Malvinas oscilan entre 475.500 y 535.000 parejas. Las razones exactas del aumento no son completamente claras, aunque es posible que hayan tenido incidencia las iniciativas para reducir la captura secundaria de aves marinas y las condiciones de alimentación favorables. Las Islas Malvinas albergan alrededor del 70% de la población global de albatros de ceja negra, y los resultados que se informaron aquí se están usando para reevaluar el estado de conservación global de la especie, que actualmente está clasificada como *en peligro de extinción*. Independientemente del estado actual de la población de las Islas Malvinas, las iniciativas deben continuar mejorando las medidas de mitigación de la captura secundaria de aves marinas, tanto para proteger la población local contra los posibles cambios en el futuro, y para mejorar el estado de conservación de otras poblaciones y especies.

RECOMENDACIÓN

Tomar nota de los resultados presentados y usarlos en las futuras evaluaciones que se realicen sobre los albatros de ceja negra.

Évaluation des tendances démographiques et du statut de conservation des albatros à sourcils noirs des îles Falkland

Les derniers dénombrements d'albatros à sourcils noirs se reproduisant sur les îles Falkland ont été menés en 2010. Des relevés aériens et terrestres ont été utilisés de manière indépendante pour recenser la population présente sur les îles Falkland. Les tendances démographiques qui se sont dégagées des précédents recensements étaient

contrastées. D'après les relevés aériens, le nombre d'individus a augmenté entre 1986 et 2005 tandis que les relevés terrestres indiquent un déclin de la population entre 2000 et 2005. On peut, par ailleurs, déduire, à partir des données historiques, que la population a décliné entre 1995 et 2005. Les relevés aériens et terrestres effectués en 2010 ont révélé une augmentation annuelle du nombre d'albatros à sourcils noirs d'au moins 4% entre 2005 et 2010. Bien qu'il existe des différences au niveau des estimations démographiques et des modèles de variation des pourcentages, la tendance positive qui se dégage de ces relevés est confortée par des données démographiques et un autre relevé aérien et photographique effectué en 2010, au cours de la saison de reproduction. Les résultats du relevé terrestre de 2010 indiquent que la population a augmenté depuis le premier relevé terrestre effectué sur tout l'archipel en 2000, voire depuis les premiers relevés terrestres menés sur les îles Beauchêne et Steeple Jason dans les années 1980. D'après les estimations actuelles, le nombre d'individus qui se reproduisent chaque année sur les îles Falkland varie entre 475 500 et 535 000. On ne sait pas avec exactitude ce qui a favorisé cette augmentation, mais les efforts déployés pour atténuer les captures accidentelles d'oiseaux marins et les conditions d'alimentation y ont probablement contribué. Environ 70% de la population mondiale d'albatros à sourcils noirs se concentre sur les îles Falkland et les résultats mentionnés dans ce rapport vont être prochainement utilisés pour réévaluer le statut de conservation mondial de cette espèce actuellement *en danger*. Malgré l'actuel statut de la population présente sur les îles Falkland, nous devons poursuivre nos efforts pour atténuer les captures accidentelles d'oiseaux marins, pour protéger la population locale contre d’éventuels changements ultérieurs et pour améliorer le statut de conservation d'autres populations et espèces.

RECOMMANDATION

Il est recommandé de noter les résultats qui ont été présentés et de les utiliser dans le cadre de futures évaluations portant sur les albatros à sourcils noirs.

1. INTRODUCTION

The Black-browed Albatross has since 2003 been classified as *Endangered* by the IUCN. The species has been assessed as *Endangered* on the basis of reported declines at large breeding colonies in the south-west Atlantic – principally those in the Falkland Islands and South Georgia – and so meets the criterion of declining at a rapid rate over three generations (BirdLife International 2012). An estimated 67-70% of the global population breeds in the Falkland Islands (ACAP 2010, BirdLife International 2012). Consequently, the global conservation status of the species is critically dependent on the status and trends of the Falkland Islands’ population.

In the Falkland Islands, Black-browed Albatrosses breed at 12 distinct sites. There have been a number of full and partial site counts of breeding birds since 1964, with complete archipelago-wide surveys conducted in 1986, 2000, 2005, and most recently in 2010 (Prince 1982, Thompson and Rothery 1991, Huin 2001, Huin and Reid 2007, Strange 2008, Strange and Strange 2011, Baylis 2012a, Baker and Jensz 2012). There have been two separate approaches to census and monitor archipelago-wide numbers of Black-browed Albatrosses in the Falkland Islands, one using aerial photographic surveys (Strange 2008, Strange and

Strange 2011, Baker and Jensz 2012), and the other using ground and boat based survey methods, including direct counts of colonies on the ground, use of transects and quadrats to estimate nest densities, and from colony and boat-based photography (Huin 2001, Huin and Reid 2007, Baylis 2012a). The ground and boat-based survey methods listed above will henceforth be referred to collectively as ground-based surveys. There have also been differences between these two census initiatives in the timing of counts. The aerial surveys have generally taken place at the commencement of breeding (late September/early October, except in 2010 when an additional aerial survey was conducted later in the breeding season), whereas the ground-based surveys have been conducted later in the breeding season (October/November), once the majority of birds have laid eggs.

Up until 2005 these two main breeding survey initiatives, using aerial and ground-based methods, reported contrasting population trends. Archipelago-wide surveys conducted in 2000 and 2005 using ground based methods, and comparing these with previous estimates, resulted in reports of sustained declines of between 0.7%-1.08% per annum (Huin and Reid 2007). On the other hand, reports of aerial photographic surveys of the Falklands' population concluded that the population – and indeed most colonies – increased between 1986 and 2005 (Strange 2008). It is clear that the very large size of some of the colonies, especially those at Beauchêne and Steeple Jason islands, and the often complex nature of the nesting terrain, present substantial challenges for conducting rigorous censuses of the Falklands' population. However, the discrepancies in these two sets of results clearly require urgent investigation and attention, including an assessment of possible differences attributable to the census methods, timing of the surveys and other factors, to get the best scientific interpretation possible of historical, recent and current data.

Most recently surveys of all breeding sites, using the same methods that had been used previously, were conducted in 2010. In order to better understand the possible reasons for the discrepancies in the breeding population and trend results previously reported, a project was initiated to conduct simultaneous aerial and ground based counts at selected colonies. Consequently, aerial photographs were taken of all colonies in late September/early October, consistent with the methodology used previously (Strange and Strange 2011). The ground based survey was conducted from late October to mid-November, consistent with the methods used in the 2000 and 2005 surveys (Baylis 2012a). The September/October surveys coincide with the commencement of the egg-laying period, whereas the ground surveys in October/November coincide with early to mid incubation. In order to assess differences between estimates derived from ground and aerial based survey methods, aerial photographs were also taken of eight of the 12 colonies on 11 November 2010, to coincide with the ground survey period. It was intended that the counts from the November aerial photographs could also be compared with those derived from the September/October photographs to assess how the timing of the census may influence estimates of breeding birds.

The purpose of this document is to present a synopsis of the recent and historical population data for Black-browed Albatrosses in the Falkland Islands, to help inform an assessment of its present conservation status in the Falkland Islands and globally. Some methodological information associated with the population estimates is also provided as it pertains to the compatibility of different estimates.

2. EARLY GROUND BASED SURVEYS OF BLACK-BROWED ALBATROSS COLONIES AT BEAUCHÊNE AND STEEPLE JASON ISLANDS

The Black-browed Albatross colonies at Beauchêne and Steeple Jason islands are by far the largest in the Falkland Islands, and indeed globally, both supporting in excess of 100,000 breeding pairs. The first full survey of the colony at Beauchêne Island was conducted in December 1980, around the hatching period of Black-browed Albatrosses at Beauchêne (Prince 1982). A total of 14 quadrats, 15m x 15m in size, were distributed between the five main breeding colonies on Beauchêne. The number of occupied and empty nests in each quadrat were counted and used to estimate the mean density of nests for the whole colony. In total 2,207 nests were counted of which 1,470 were occupied at the time, and 737 were unoccupied (Prince 1982). It was assumed that unoccupied nests at the time of the census represented nests that had failed during the incubation stage, and that the combined count of occupied and unoccupied nests represented the total breeding effort of the year. The mean density of nests (occupied and unoccupied) was 0.70 nests per m^2 (Prince 1982). The area covered by breeding birds was determined by using high altitude vertical aerial photographs. The date of the photographs and the altitude at which the photographs were taken is not reported. However, it is assumed that the photographs are of a similar nature to the photographs used by Thompson and Rothery (1991) – see below – which were taken from an altitude of 4156m. Using the mean nest density estimate (0.70 nests per m^2) and the area of the colony, calculated from the aerial photographs, the breeding population at Beauchêne was estimated to be 162,360 breeding pairs; for occupied nests only the estimate was 108,994 breeding pairs (Prince 1982, Table 1). It was acknowledged that the figure of 162,360 may be a slight overestimate because no quadrats were established around the edges of the breeding colonies, where density is likely to be reduced (Prince 1982). On the basis of this and the timing of the census, the figure was estimated to be within the range 140,000 – 170,000 breeding pairs.

Using a similar approach to Prince (1982), a census of breeding Black-browed Albatrosses was conducted on Steeple Jason Island from 13-22 December 1987, the peak hatching period for Black-browed Albatrosses at the island (Thompson and Rothery 1991). The occupied colony area was estimated using high altitude aerial photography. The photographs were taken in December 1983 (i.e. four years before the census) from an altitude of 4156m. Nest density was measured from 33 quadrats, each 15m x 15m in size, and comprising 2.2% of the total colony area (Thompson and Rothery 1991). As with Prince (1982), quadrats were not placed within 5m of the colony edge, which may result in overall nest density being overestimated. This is especially the case at colonies such as Steeple Jason and Beauchêne, which have a relatively high perimeter edge to colony area ratio. The overall nest density was estimated to be 0.675 per m^2, and ranged from 0.26-1.03 (Thompson and Rothery 1991). The census was carried out at the end of the incubation period. Although unoccupied nests were included in the total nest density estimate, it is unknown what percentage of these represented breeding attempts of that year - that is, nests where birds laid an egg, with subsequent loss of the egg or chick prior to the census, as opposed to nests that remained empty the entire breeding season (Thompson and Rothery 1991). Using the colony area and nest density measurements, the population was estimated to be between 196,600 and 232,700 breeding pairs, of which between 153,200 and 178,400 nests were occupied by breeders at the time of the census (Table 1).

3. GROUND BASED SURVEYS: 2000-2010

Archipelago-wide surveys of breeding Black-browed Albatrosses using ground and boat-based methods were conducted in 2000, 2005 and 2010 (Huin 2001, Huin and Reid 2007, Baylis 2012a). Three main census methodologies were used, depending on the size of the colony, and the nature of the terrain. Where feasible (based on colony size, accessibility and time ashore) incubating birds were counted directly, either by entering the colonies, or scanning from outside the colonies with binoculars. For colonies, or sections of colonies that were spread along cliff faces and difficult to count from the land, photographs were taken, either from a boat, or from land, and incubating birds counted from the photographs. Finally, for the large colonies at Beauchêne and Steeple Jason islands, and sections of Grand Jason Island, nest density and colony area measurements were used to estimate the size of the breeding colony. Density measurements were conducted using strip transects and quadrats, and colony area was measured by walking around and mapping the perimeter of the colony by means of a compass or handheld GPS (Huin and Reid 2007).

The methodology used in each of the three censuses was generally consistent, although there were sometimes slight differences in the timing of censuses (Table 2). These ground-based censuses were timed to take place at soon after the majority of birds had laid eggs. However, given the logistical challenges in accessing and counting all 12 breeding colonies, the census generally takes about 3-4 weeks to complete. In addition to the archipelago-wide surveys, nest density measurements have been recorded in some years at Beauchêne (1991 and 1996) and Steeple Jason (1995 and 2003) islands (Table 1, Huin and Reid 2007).

Huin and Reid (2007) reported the census results up until and including the 2005 census, which have been used in species assessments conducted by ACAP (2010) and for the purpose of IUCN Red List assessments (BirdLife International 2012). Briefly, these island-wide surveys showed a reduction in the number of breeding pairs from c. 415,000 to 400,000 during this period, a decline of 0.7% per annum (Huin and Reid 2007). Count data were available for some breeding sites between 1995 and 2000. For these sites, the site-specific trend between the count date and 2000 was calculated, and the weighted average of all trends (weighting colony size) was used to estimate the annual population trend for the total population between 1995 and 2000, which was -1.08% per annum, with an estimated breeding population in 1995 of 437,855 pairs (Huin and Reid 2007). It is acknowledged that the 'back-calculation' is based on few data from different years (for the period 1995-2000), but the purpose was to assess broadly the trends for the period 1995-2005 (Huin and Reid 2007). On this basis, it was reported that the annual rate of decline for the period 1995-2000 (-1.08%) was more rapid than the decline in the period 2000-2005 (-0.7%). The rate of decline was not consistent between sites, and even between sub-colonies within sites, with some colonies, such as North Island, showed an increasing trend (Table 3).

In October-November 2010, the third ground-based archipelago-wide census was conducted, using the same methodology employed in the previous two censuses. Three of the 12 breeding sites were not counted: Grand Jason, New Island and West Point Island. The results of the surveys are presented in Table 3, and it is important to note that both the 2010 counts and the counts from 2005 and 2000 have excluded unoccupied nests. Consequently, the values reported in this document (and Table 3) differ from those reported in Huin and Reid (2007), which distinguish between these two categories of nests, but include unoccupied nests when reporting the total number of breeding pairs. Excluding the unoccupied nests is considered more appropriate because it is not known what proportion of these empty nests represents actual breeding attempts of the census year that have failed prior to the census.

For those sites ground-surveyed in 2010, the number of occupied nests increased substantially between 2005 and 2010, the percentage increase for the period ranging from 2-52% (Table 3), equivalent to 0.4 to 8.6% per annum. The only site at which numbers declined was the small colony at Penguin Point (Grave Cove). However, counts from both sets of aerial photographs (see below, and Table 6) show this colony to be larger than estimated by the ground-based survey, so it is possible that some sections of this colony were missed. Importantly, results from the ground-based census show significant increases in breeding numbers at the two largest colonies, at Beauchêne and Steeple Jason islands (Table 3). Numbers of Black-browed Albatrosses breeding at Beauchêne Island increased from 94,010 occupied nests in 2005 to 139,336 occupied nests in 2010, an overall increase of 48% and an estimated annual rate of increase for the period of 8.2% At Steeple Jason Island, the number of occupied nests increased from 141,690 in 2005 to 214,203 in 2010, an increase of 51% for this period, and an annual rate of increase of 8.6% This level of increase is likely too great to be accounted for by recruitment of young birds alone, so suggests a high rate of breeding deferral or breeding failure in 2005 (see below). The increases from 2005 to 2010 at Beauchêne and Steeple Jason islands were driven mostly by an increase in the density of occupied nests: 44% and 40%, respectively (Baylis 2012a). From 2005 to 2010, the colony area increased by 8% at Beauchêne Island, and 3% at Steeple Jason Island, although this varied substantially between areas within both of these sites (Baylis 2012a). The 2010 estimates for these two large colonies also represent substantial increases when compared with the figures from the 2000 census (Table 3). The magnitude of the increase in the density of nests between 2005 and 2010 is surprising, and suggests again that breeding deferral and failure may have been high in 2005, and perhaps also in 2000. It is also possible that implementation of the density-area surveys varied slightly between censuses. For example, differences in the location and number of transects between censuses may have contributed to some of the measured differences in nest density.

Although the increases were greatest at Beauchêne and Steeple Jason islands, most of the other colonies also increased over the periods 2005-2010 and 2000-2010 (Table 3). Excluding the three colonies not counted in 2010, the overall increase in the number of birds breeding between 2005 and 2010 was 46%; from 2000 to 2010 the number increased by 35%

The estimates of numbers breeding at Beauchêne and Steeple Jason islands in 2010 are within the range of estimates reported for these colonies when they were surveyed in the 1980 and 1987, respectively (Table 1). In fact, if one considers occupied nests only, then the 2010 figures are larger than those reported in the 1980s. However, these estimates are not strictly comparable because the 1980s surveys were conducted later in the breeding season (around the hatching period), by which time a larger proportion of the nests would have failed.

4. AERIAL PHOTOGRAPHIC SURVEYS OF BLACK-BROWED ALBATROSSES IN THE FALKLAND ISLANDS

4.1. Surveys of birds at the commencement of the breeding season (September/October)

Aerial photographic surveys of Black-browed Albatross colonies in the Falkland Islands have been conducted since 1964 (Strange 2008, Strange and Strange 2011). Surveys of all 12 breeding sites were carried out in 1986, 2005 and 2010, with part site counts conducted in these and a number of other years (Tables 4 and 5). The plots or part-sites (Table 5) are areas that have been delineated using landmarks to enable between-year comparisons. The results included in this report have been obtained from Strange (2008) and Strange and Strange (2011), which do not present all of the individual figures from the 1986 survey.

The aerial surveys have generally been conducted from late September to early October, earlier than the timing of the ground-based surveys. The objective of these surveys is to count the number of individual adult birds that return to the breeding colonies and occupy nests in the early part of the breeding season (at the commencement of egg-laying). It is acknowledged that such surveys are not estimates of how many birds actually attempt to breed (lay an egg) as they include birds that return and occupy nests in the early part of the season but do not go on to breed. Rather, the survey provides an estimate of birds returning to the colony and occupying nest sites at the commencement of the egg-laying period (Strange and Strange 2011). Some of the earlier photographic surveys were conducted later in the season (October or November) and so a correction factor was applied to ensure these earlier figures are comparable with the more recent surveys. A correction factor of 1.02% has been applied to a number of photographs that were taken later in the season, and is based on photos taken of the Steeple Jason colony on 24 November 1986. Counts from ten different sections of the Steeple Jason colony showed that the percentage of unoccupied nests at this time ranged from 0.2% to 1.6%, with an average of 1.02% It was assumed that these unoccupied nests would have been occupied at the commencement of the breeding season and subsequently left the colony (i.e. the period at which subsequent surveys were conducted), and so to ensure compatibility with photos taken in September/October in later years, the 1986 counts of Steeple Jason were inflated by 1.02% (Strange 2008, Strange and Strange 2011). This correction factor was applied to counts of Steeple Jason and Grand Jason islands in 1986 and to aerial photographic surveys of birds at Beauchêne Island on 4 December 1964 and 23 October 1983 (see Tables 4 and 5). It should be noted, though, that one cannot assume that every nest in the colony is occupied at the commencement of the breeding season, and so this correction factor may have led to slightly over-inflated estimates.

Results of the aerial photographic surveys show a sustained increase in numbers of birds breeding at all colonies and part-sites from the commencement of the surveys until 2010 (Tables 4 and 5). At sites such as New Island, where regular surveys have been conducted, some inter-annual fluctuation in numbers is evident, but the overall trend is positive. Overall, the increasing trend was broadly consistent across sites, with some variation in the degree of change (Tables 4 and 5), and in the case of one part-site (Bird Island Plot 2) a decline between 1986 and 2005 (Table 5). The overall trend for Bird Island population was positive, and it seems likely that the decline at Plot 2 is due to a change in the distribution of breeding birds on the island (Strange 2008). On the basis of the aerial photographic surveys of all breeding sites in the Falklands, the population was reported to have increased by 34% between 1986 and 2005, and by 21.8% between 2005 and 2010 (Strange and Strange 2011). This represents an average annual rate of increase of 1.6% for the period 1986 to 2005, and 4% from 2005 to 2010. The latter figure is consistent with the annual rate of growth estimated from six intensively monitored study plots at Settlement Rookery, New Island, where ground-based counts from 2004 to 2009 show an annual rate of increase in breeding numbers of 4% (Catry et al 2011).

4.2. November 2010 aerial photographic survey and comparison with other 2010 surveys

In order to better understand the reasons for differences between census estimates derived from aerial and ground-based surveys prior to 2010, additional aerial photographic surveys of 8 of the 12 colonies were conducted on 11 November 2010. These aerial surveys were timed to coincide with the ground-based surveys being conducted in 2010, although the ground based surveys spanned a longer period (2-13 November for colonies that were surveyed using both methods). Another objective of this initiative was to compare the estimates from the November 2010 photographs with those obtained from photographs taken earlier in the season (September/October 2010). The November 2010 photographs were taken by Georgina Strange (who formed part of the team with Ian Strange that took the photos in September/October). Both sets of photographs were taken from a Sikorski helicopter. The photographs taken in September/October were analysed and counted by Ian Strange (Strange and Strange 2011). The November 2010 photographs were provided to Latitude 42 - an Australian based environmental consultancy with experience in aerial photography of albatross colonies in Australia and New Zealand - for analysis and counting (Baker and Jensz 2012).

Of the photographs provided, the majority were of sufficient quality to enable accurate counting of occupied nests. However, 20% of the images provided were classified as being difficult to count, either because the photos were taken from too great a distance for the lens magnification used, or because they were taken at an angle that was too oblique to the colony surface (Baker and Jensz 2012). This led to either extensive pixilation which affected the accuracy of counting, or to situations of extreme parallax where birds in distant parts of the colony (mid or background of photograph) could not be differentiated from each other. These issues were most prevalent in photographs of the Steeple Jason colony. For sections of the colonies that could not be counted directly from the aerial photographs, the grid tool in

Photoshop was used to count birds from adjacent areas, from which the mean values were used to estimate numbers in the areas that could not be counted. Where this was necessary, for each image 10 grids that were fully occupied were randomly selected to derive a mean value; the number of grids and the estimated occupancy (proportion) of each grid that contained birds that could not be counted was determined, and the mean value applied accordingly. Such a technique will underestimate the number of birds in the sections of the photo where this used, because these areas are usually toward the background of each photo, and will contain more birds than in foreground areas due to the effects of parallax (Baker and Jensz 2012). Of the 201,986 birds counted at Steeple Jason (Table 6), 80,211 (40%) were estimated because the image quality of 19 of the 63 photographs used for this island was too poor to permit direct counting.

The photographs were taken between 11h00 and 14h30 local time, when it was expected that the number of loafing birds and attending partners would be at a low level (Poncet at al. 2006, Robertson et al. 2008). For the purposes of counting, it was not possible to distinguish between loafers, attending partners and birds on nests, and each individual bird was counted as a breeding pair. Consequently, inclusion of any partners or loafers in the colony at the time will overestimate numbers of birds breeding. A ground-truthed aerial photographic survey of breeding Black-browed Albatrosses at the Ildefonso Archipelago in Chile revealed that 5% of the birds photographed were loafing in the colony, and the ratio of nesting to total birds was highest around the middle of the day (Robertson et al 2008). The November aerial photographic census of the Falklands' colonies took place at a similar stage of the breeding cycle to the Ildefonso census, so the estimates may be positively biased by a similar percentage (up to 5%). The counts from the November 2010 aerial photographs have not been adjusted, because work is underway to quantify this ratio for the Steeple Jason colony. Another source of error, which is applicable to all survey methods which aim to estimate the number of birds attempting to breed in a given year (i.e. not just aerial photographic surveys), is the assumption that all occupied nests represent breeding attempts. This will lead to inflated estimates of breeding pairs if a significant number of nests are occupied by pre-breeders or non-breeders (adults skipping a year or searching for a new mate). On the basis of nest inspections, Robertson et al (2008) estimated that 7% of occupied Black-browed Albatross nests at the Ildefonso archipelago in Chile did not contain an egg. However, this proportion will not be constant because the total number of occupied nests varies with time of day (Poncet et al. 2006, Robertson et al. 2008). It is possible that some of these empty nests had failed prior to the census, but in the Falkland Islands nonbreeders (deferring birds and pre-breeders) are frequently observed occupying nests (P. Catry, pers. comm.) This source of error has not been quantified, and accounted for, in any of the archipelago-wide surveys of breeding birds in the Falkland Islands.

The counts from the November 2010 aerial photographs were generally within 10% of the counts from the September/October 2010 aerial photographic survey (Table 6). Estimates from the November survey were greater for five of the eight colonies, and in all but two cases were within 10% of the estimates from the September/October survey. The estimates obtained from the November aerial photographic survey differed by between 6% and 16% when compared with the ground-based surveys conducted around the same time (Table 6). This range excludes Grave Cove (Penguin Point), where there was a difference of 44%, which, given the larger numbers obtained in both 2010 aerial surveys, is likely due to some sections of the colony being missed in the ground-based counts. For those colonies counted in their entirety from both ground and aerial methods, estimates from the ground-based surveys were lower than those obtained from both sets of aerial photographs (Table 6). In contrast, estimates from the ground-based surveys of the colonies at Beauchêne and Steeple Jason islands, which were based on extrapolated area and density measurements, were larger than the estimates from the aerial surveys. The ground survey estimate for Beauchêne was 17% greater than the count obtained from the September aerial photograph; for Steeple Jason Island, the ground-based survey in November was 32% greater than the count from the aerial photograph taken in October and 6% greater than the count of the November aerial photograph (Table 6).

4.3. Other population data

Demographic parameters of Black-browed Albatrosses have been monitored on an annual basis at New Island and Steeple Jason Island since 2003 and 2006, respectively. The New Island study has shown that between 2003 and 2009 the mean annual adult survival across breeding stages and sexes was 0.942 (Catry et al 2011). The mean breeding success over this study period was 0.56 fledged chicks per laid egg, and the breeding frequency was amongst the highest reported for *Thalassarche* albatrosses (Catry et al 2011). Moreover, systematic counts of breeding birds in six intensively monitored study plots show an increase of 4% per annum from 2004 to 2010 (Catry et al 2010). From 2004 to 2011 annual breeding success of Black-browed Albatrosses at Steeple Jason Island ranged from 0.21 to 0.73, with an average for the period of 0.51 (Falklands Conservation, unpubl. data). A storm event during the 2010 breeding season (after the archipelago-wide survey was completed) severely reduced breeding success at most of the Steeple Jason study plots, and resulted in complete failure at one of the study subcolonies (Wolfaardt et al 2012). An initial assessment of adult survival at the Steeple Jason colony in 2009 suggested an annual survival rate (based simply on the recovery of marked birds) for the period 2006-2008 of 0.94 (Pistorius 2009), similar to the survival estimate for adult albatrosses at New Island. A more rigorous assessment of survival rates at Steeple Jason Island will be possible following a few more years of monitoring.

5. DISCUSSION

The large size of the Black-browed Albatross population in the Falkland Islands, and especially the two large colonies at Beauchêne and Steeple Jason islands, present enormous challenges for obtaining accurate estimates of the population size and trends. A number of different methods have been used since 1964 to census the breeding population, either at individual breeding sites, and part-sites, or of the total breeding population (i.e. at all 12 breeding sites). Differences in methodology, including the timing of censuses, make it difficult to compare directly the range of population estimates between and within years. Prior to the 2010 census, the population trends reported by Strange (2008) and Huin and Reid (2007), based on aerial and ground-based surveys, respectively, were in contrast. Strange (2008) reported an increase in the population between 1986 and 2005 of 34%, which equates to an average annual rate of increase of 1.6% over this period. On the other hand, Huin and Reid (2007) estimated that Black-browed Albatrosses breeding in the Falkland Islands declined by 0.7% per annum between 2000 and 2005. Based on earlier counts from some sites, Huin and Reid (2007) estimated that the population declined between 1995 and 2000 at an annual rate of 1.08%

The 2010 estimates from all survey methods show a substantial increase in the numbers breeding compared to previous estimates. Strange and Strange (2011) report a 21.8% increase in breeding numbers overall between 2005 and 2010, equivalent to an annual rate of increase of 4%, a more rapid increase than reported for the earlier period, 1986-2005. The only exception to the overall increase was at Beauchêne Island, where numbers declined by 2% over the five year period (Strange and Strange 2011). For those colonies surveyed using ground-survey methods in 2000, 2005 and 2010, the estimate of overall numbers was 46% higher in 2010 than in 2005, and 35% higher than the estimate for 2000. This equates to an average annual rate of increase of 7.8% from 2005-2010 and 3% from 2000-2010. The level of increase between 2005 and 2010 is likely too great to be accounted for by recruitment of young birds alone, and suggests a high rate of breeding deferral or breeding failure in 2005 (see below), and perhaps slight methodological differences between surveys. Moreover, annual monitoring of study plots at Steeple Jason reveals a high degree of inter-annual variability in numbers breeding. Consequently, the average annual rate of increase reported here is not necessarily fully representative.

The 2010 ground-survey estimates for Beauchêne and Steeple Jason islands are within the range reported for these colonies in the 1980s (Prince 1982, Thompson and Rothery 1991). In fact, if one considers occupied nests only, the 2010 estimates are greater than those reported from surveys in the1980s. However, given differences in the methodology, and especially the timing of the censuses in the 1980s and 2010, a rigorous comparison is not possible.

The November 2010 aerial survey results were generally within 10% of the estimates from the September/October 2010 aerial survey and within about 15% of the November 2010 ground-based surveys. Estimates from the November aerial survey were greater than those from the September/October aerial survey for five of the eight colonies. Although failed birds and nonbreeders would more likely be in lower attendance by November, this is perhaps counteracted by the attendance of younger pre-breeders which may not arrive until later in the season. The inability to distinguish ‘loafing’ from nesting birds, and the estimation methods required at the Steeple Jason colony, in 2010, may have contributed to a positive bias in the estimate. The 2010 aerial survey estimates (from both the September/October and November surveys) were greater than those obtained from ground surveys, except for the two colonies at which extrapolated estimates were derived from density and area measurements: Beauchêne and Steeple Jason islands. A more detailed comparison of aerial and ground survey counts and estimates for smaller sections of the colonies at Beauchêne and Steeple Jason islands is recommended to help clarify these differences.

Although there are still differences in the actual estimates of the breeding population and the rates of change, there is general agreement that at least over the last five years the population has been increasing by at least 4% per annum. Although the results from the ground-based surveys show that the population declined from 2000-2005 (Huin and Reid

2007), the most recent ground survey indicates an overall increase between 2000 and 2010 of about 3% per annum.

When considering the results over this period (2000-2010), the population trajectory derived from ground-based surveys would be similar to that reported for a similar period (1986-2010) by Strange and Strange (2011) using aerial photography, except for the decline between 2000 and 2005. The reason for the discrepancy in 2005 is not entirely clear. Average breeding success of Black-browed Albatrosses in 2005 was the lowest on record at New Island (Catry et al 2011) and Steeple Jason Island (except for 2010, when a storm after the census severely reduced breeding success Baylis 2012b), where colonies have been monitored annually since 2003 and 2004, respectively. Except for Saunders Island, the 2005 ground-based surveys took place later in the breeding season than in 2000 (see Table 2). If large numbers of birds failed prior to the census in 2005, this may have led to some failed breeding attempts not being recorded, and an underestimate of the numbers of birds that attempted breeding in that year. The same conditions that led to low breeding success may also have resulted in a relatively high rate of breeding abstinence, which could also help explain the lower numbers recorded breeding in the 2005 ground-based surveys. Although the percentage of occupied and unoccupied nests counted in quadrats on Beauchêne and Steeple Jason islands provide some insight into the possible extent of breeding failures (see Table 1), this assumes that all unoccupied nests represent failed breeding attempts from that season. Figures for nest failure rates at New Island during the 2005 breeding season (P. Catry unpubl. data) could provide some insight into the possible extent of such a bias.

Notwithstanding the differences in the population trajectories, or change-points in these trajectories, both survey methods, point towards a real and large increase between 2005 and 2010, and a smaller increase between 2000 and 2010. The increase for the most recent period (2005-2010) is further supported by annual population monitoring of Black-browed Albatrosses at New Island and to a lesser extent at Steeple Jason Island. At New Island, monitored nests from six study colonies at the Settlement Rookery increased by 4% per annum from 2004 to 2009; survival and the breeding frequency of adult breeders was high, and consistent with an increasing population (Catry et al 2011). Although there are not yet sufficient data from the demographic study at Steeple Jason island to rigorously assess survival, early estimates, based on recovery of marked individuals, suggests an annual adult survival rate of 0.94 (Pistorius 2009). Interestingly, a number of annually monitored study plots on Steeple Jason Island show high levels of inter-annual variability in the number of breeding pairs, and perhaps somewhat surprisingly do not reflect the overall 50% increase in numbers between 2005 and 2010 (Falklands Conservation unpubl. data). This highlights that even within colonies there is variation in the numbers of birds breeding and also suggests that the study plots at Steeple Jason may not be fully representative of the entire colony.

Based on the September/October aerial photographic survey, the breeding population in 2010 was estimated to be 475,465 breeding pairs (Strange and Strange 2011). Of the 12 breeding sites in the Falkland Islands, 3 (Grand Jason, West Point and New Island) were not fully surveyed in the ground-based census of 2010 (Baylis 2012a). If it is assumed that the numbers of birds breeding at these three colonies remained unchanged since the 2005 census, the ground-based census estimate for the breeding population in 2010 would be

483,887 breeding pairs. Given the increase in numbers at all sites (except Grave Cove) between 2005 and 2010, this assumption is likely to be incorrect. Deriving the missing numbers from the aerial photographs taken in September/October and November 2010, results in total breeding population estimates in 2010 of 530,791 and 535,602, respectively (Table 3). On the basis of all of these figures, it would appear that the Black-browed Albatross population in the Falkland Island lies between 475, 500 and 535,000 breeding pairs. Assuming that other populations have remained stable, this equates to between 70% and 73% of the global population (ACAP 2010). The second largest population of Black-browed Albatrosses at South Georgia continues to decline at c. 4% per annum (Poncet et al. 2006, BAS unpubl data), so it is possible that the Falklands' population represents an even greater proportion of the global total.

These results confirm a much more favourable conservation status for Black-browed Albatrosses in the Falkland Islands than its current IUCN classification of *Endangered* would suggest. Monitoring of demographic parameters and population trends show that the population has been increasing at a minimum of 4% per annum since 2005. The Falklands' population also increased in size between 2000 and 2010, although the nature of the population trajectory up until 2005 varied between the different survey methods used. Given the favourable conservation status of Black-browed Albatrosses in the Falkland Islands, which comprise c. 70% of the global total, the results presented here are currently being used to re-assess the global conservation status of the species.

The increasing numbers of Black-browed Albatrosses breeding in the Falkland Islands is likely due to a combination of at-sea factors. There is no evidence that land-based factors, such as predation, disturbance or disease, are affecting, or have affected, albatross populations in the Falkland Islands. There have been documented incidents of disease (Uhart et al 2004, Baylis 2011, Catry et al 2011) and large-scale breeding failure due to storm impacts (Wolfaardt et al. 2012). However, these have been infrequent and limited in extent, and are unlikely to have had a significant long-term impact on Black-browed Albatross populations in the Falkland Islands. The increase in numbers may at least partly reflect efforts to reduce mortality of seabirds associated with fisheries in the Falkland Islands and the broader region.

The estimated rate of seabird bycatch, predominantly Black-browed Albatrosses, associated with longline fishing in the Falkland Islands declined from 0.016 birds/1000 hooks in 2001/2002 to 0.005 seabirds/1000 hooks in 2003/04 (Reid et al 2004, Otley et al,. 2007). The bycatch rate remained at a similarly low level until 2007/08, when no albatross mortalities were recorded within the Exclusive Economic Zone of the Falkland Islands. The zero mortality record has been maintained since 2007/08 due to the effective implementation of mitigation measures, and the recently adopted (since July 2007) 'cachalotera'/'umbrella' or 'Chilean longline' system, which poses less of a risk to seabirds due to the more rapid sinking of the hooked line (Moreno et al 2008, Brown et al 2009). Although the bycatch rate in the Falkland Islands longline fishery has been reduced to zero, the earlier bycatch rates, from 2001 onwards, are likely to have had only a minor impact on the Black-browed Albatross population of the Falkland Islands. For example, the bycatch rate of 0.016 birds per 1000 hooks for the 2001/2002 fishing season equates to a total estimate of 134 birds (Reid et al 2004), a small number when related to the total Falklands population. In addition to the bycatch mitigation measures currently employed, the preference of Black-browed Albatrosses for foraging in shelf waters rather than deeper oceanic waters (Huin 2002), such as those where longliners operate in the Falklands, also contributes towards the reduced risk of seabird bycatch in this fishery.

The much larger trawler fleet in the Falklands is considered to have a greater impact on the local Black-browed Albatross population than the longline fishery (Sullivan et al. 2006a). Seabirds are generally attracted to trawlers as they have learnt that the vessels are potential sources of food (due to the discharged offal and bycatch released from the vessels). Although discards and offal provide a potential source of food for these seabirds (see below), attending birds are at risk of being killed as a result of interactions with trawl gear. The first estimate of seabird mortality associated with the trawler fleet in the Falkland Islands was for the 2002/2003 fishing season, when a minimum of 1529 birds (the majority of which were Black-browed Albatrosses) were estimated to have been killed (Sullivan et al. 2006b). These and all subsequent estimates of seabird mortality in the Falkland Islands are considered to be minimum figures because they are based on carcasses that are hauled aboard and do not account for birds that died and were lost at sea. Dedicated observations of seabird interactions with trawl gear during the 2010-2011 fishing season indicates that a minimum of 36% of interactions recorded as being of unknown outcome (and thus not included in the overall mortality estimates) resulted in subsequent mortality (Parker 2012).

Following the introduction of tori lines as a mandatory mitigation measure in the trawl fishery in 2004, seabird mortality was observed to decline by c. 90% (Reid and Edwards 2005) to an estimated mortality rate of 0.07 birds per vessel day. Subsequent mortality estimates for the finfish trawl fishery in the Falkland Islands show that the bycatch rate increased to 0.14-0.15 birds per vessel day for the period 2007-2009 (Sancho 2009), and then declined to 0.03 birds per vessel day in the 2009-2010 fishing season (Black 2011). The estimated bycatch rate for the 2010-2011 fishing season was 0.41 birds per vessel day, equating to a total of 1421 birds, of which the majority were Black-browed Albatrosses (Parker 2012). The most recent seabird mortality estimate represents a considerable increase compared to estimates from the preceding five years, and is similar to the seabird bycatch estimate reported for the period immediately prior to the introduction of tori lines. It must be noted that the estimates are based on a relatively low level of observer coverage (3% of fishing effort), which results in low levels of precision in the estimates, and concerns about extrapolating from recorded mortalities to the entire fishery. Whether the 2010-2011 season was anomalous in terms of the increased seabird mortality will be possible to assess once the estimates from the current and future fishing seasons are available. Overall, the introduction and use of tori lines in the Falkland Islands' trawl fishery has reduced seabird bycatch, and efforts are underway to improve the effective use of the current suite of mitigation measures, including investigating modifications to the tori line design. However, the most effective measure to reduce bycatch of seabirds in trawl fisheries lies in the implementing fish waste (offal and discards) management practices that reduce the attractiveness of vessels to seabirds (Munro 2005, Bull 2009).

Black-browed Albatrosses from the Falkland Islands overlap with a range of 'external' fisheries, especially over the Patagonian Shelf, many of which have in the past recorded high levels of seabird bycatch (Anderson et al 2011). A number of initiatives are underway to test and introduce mitigation measures into many of these fisheries, and these efforts may also have contributed to the favourable conservation status of Black-browed Albatrosses in the Falkland Islands (BirdLife International 2011).

Although the population data for Black-browed Albatrosses in the Falkland Islands suggests that the current level of fisheries related mortality is not having an adverse affect on the local population, it is important that efforts continue to minimise incidental seabird mortality. Although the current bycatch rates are not driving a decline in the local population, should environmental conditions become less favourable, even low levels of bycatch could contribute to a decline in the population (Catry et al. 2011). Furthermore, there are other species and populations more threatened than the Black-browed Albatross population in the Falklands that are also affected by bycatch in the broader Patagonian shelf region (Tuck et al. 2011). For many of these, bycatch in fisheries is considered to be the main threat, and likely responsible for driving population declines.

The abundance and availability of food is another factor that has an important impact on population parameters. It has been suggested that previous increases in the Black-browed Albatross population in the Falkland Islands (in the 1980s) were probably attributable to abundant offal and discards made available by trawl vessels (Croxall and Gales 1998, Thompson and Riddy 1995). There is no doubt that fishery waste provides a source of food for seabirds, including albatrosses, in the Falkland Islands. However, the issue is more complex than may first appear. For example, Thompson (1992) estimated that Black-browed Albatrosses in the Falkland Islands obtained 10-15% of their food during the breeding season from the *Loligo* squid fishery. However, the overall conclusion from this study was that the fishery had a greater impact on the *Loligo* stocks than the albatrosses did prior to the commencement of the fishery. So, although the albatrosses may obtain food from the discards provided by the fishery, competition between albatrosses and the fishery for the squid resource also needs to be considered, making it difficult to quantify the overall impact of the fishery on the albatross population (Thompson 1992).

A recent study, which conducted fine-scale tracking of breeding Black-browed Albatrosses, and compared the distribution of birds with the movements of trawl vessels in the Falklands, found a low level of overlap between the two (Granadeiro et al. 2011). Adult breeders were tracked from New Island and Steeple Jason Island during the early chick-rearing period, when the increased energy demands on breeders restrict their foraging range from the colony. Although there were differences in the degree to which birds from these two colonies associated with trawl vessels, the results suggest that these populations had little reliance on fisheries discards, at least during the early chick rearing period (Granadeiro et al. 2011). Similarly, off South Africa non-breeding Black-browed Albatrosses spend substantially more time feeding on natural prey than on fishery discards (Petersen et al. 2008). Clearly, the bycatch of albatrosses in the Falklands' trawl fishery highlights that a portion of the population does follow vessels and may benefit from this association. However the provision of discards and offal is the primary factor leading to mortality of seabirds in the Falkland

Islands, and indeed in other trawl fisheries. Consequently, strategic management of fishery waste remains a critical priority for reducing seabird bycatch in trawl fisheries, and is likely to lead to a net conservation benefit for seabirds.

The favourable conservation status of Black-browed Albatrosses breeding at the Falkland Islands contrasts with the second largest population breeding at South Georgia, which continues to decline at c. 4% per annum (Poncet et al. 2006, BAS unpubl. data). Due to a time-area closure of the South Georgia fishery, and the restricted foraging range during the chick-rearing period (Phillips et al. 2004), adult Black-browed Albatrosses from South Georgia show little overlap with fisheries during this period. However, during incubation, birds, and especially males forage northwest of the colony, mainly in pelagic waters, but also on the Patagonian Shelf (Phillips et al. 2004), an area also used by birds from the Falkland Islands. During the non-breeding period, most birds over-winter in the Benguela Upwelling system off South Africa (Phillips et al. 2005), where they overlap with longline and trawl fisheries which have recorded very high levels of incidental mortality (Anderson et al. 2011). There is no evidence that birds from the Falkland Islands travel to the Bengeula region, which could at least partly explain the different trends of these populations. Other factors, such as the availability of food to the two populations, both within the breeding season, and throughout the year, are also likely to contribute to the contrasting trends of these populations. Repeat censuses of the Black-browed Albatross population at the Ildefonso Archipelago, Chile, in 2002 and 2006, suggest that the population remained stable during this period (Robertson et al. 2004).

The exact nature, and relative importance, of the factors driving the increasing population of Black-browed Albatrosses in the Falkland Islands are not entirely clear. For this reason, and to monitor how the population responds to possible future ecosystem changes, it is important to continue and expand work on the demography and foraging ecology (including diet and interaction with fisheries) of the Falklands population. Future censuses of Black-browed Albatrosses in the Falkland Islands should use the most accurate and repeatable methodology, and be designed so as to minimise and account for error. A separate document is in the process of being prepared that provides methodological recommendations for future censuses. In the shorter term, it would be useful to use data on the timing of nest failure from New Island (P. Catry, unpubl. data) to determine how variable this rate is across years, and to investigate using the mean rates to correct for error associated with timing of counts in census years. This may, for example, help clarify the effect of the later ground-survey counts in 2005. Finally, it is important to reinforce efforts to reduce further seabird bycatch in the region. This will serve to buffer those populations with a currently favourable conservation status against possible future ecosystem changes and impacts, and improve the conservation status of those species and populations currently threatened by fisheries mortality.

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Table 1: Mean density of Black-browed Albatross nests/m^2 from surveys at Beauchêne and Steeple Jason islands, 1980 to 2010. It is important to note that the 1980 survey took place considerably later than all the other surveys. The 1980 census was conducted around the hatching period, by which time it was estimated about 33% of nests had failed, so caution is required when comparing estimates.

Site	Year	Date	Mean Density (nests/m^2)			Estimate	Estimated range	Reference/Study	Remarks
			Occupied	Empty	Total				
Beauchêne Island	1980	11-14 December	0.46	0.23	0.7	162,360	140,000-170,000	Prince (1982)	Estimate based on all nests, including unoccupied; 109,000 contained eggs or chicks at time of census
	1991	Not recorded			0.60			Huin & Reid (2007)	
	1996	Not recorded			0.68			Huin & Reid (2007)	
	2000	23-28 October	0.56	0.04	0.59	96,693		Huin & Reid (2007); Baylis (2012a)	Estimate based on occupied nests only
	2005	11-15 November	0.48	0.11	0.59	94,010		Huin & Reid (2007); Baylis (2012a)	Estimate based on occupied nests only
	2010	23-26 October	0.64			139,336		Baylis (2012a)	Estimate based on occupied nests only
Steeple Jason Island	1987	13-22 December			0.67	200,000	196,600-232,700	Thompson & Rothery (1991)	Estimate based on all nests, including unoccupied; range for occupied nests at time of census: 153,200-178,400
	1995	Not recorded			0.76			Huin & Reid (2007)	
	2000	11-15 November	0.58	0.11	0.69	161,704		Huin & Reid (2007), Baylis (2012a)	Estimate based on occupied nests only
	2003	Not recorded			0.503			Huin & Reid (2007)	
	2005	22-25 November	0.48	0.11	0.59	141,690		Huin & Reid (2007)	
	2010	5-13 November	0.69			214,203		Baylis (2012a)	Estimate based on occupied nests only

Table 2: Timing of censuses conducted by Falklands Conservation between 2000 and 2010 for selected islands (Baylis 2012a).

	Dates counted		
Location	**2000**	**2005**	**2010**
Beauchêne Island	Oct 21 - 22	Nov 03 – 09	Oct 23 – 26
Steeple Jason Island	Nov 11- 15	Nov 22 – 25	Nov 05 – 13
Grand Jason Island	Nov 16 –17	Nov 27 – 28	Nov 07 – 10
North Island	Nov 6	Nov 18	Nov 02
Bird Island	Nov 2 – 3	Nov 13 – 14	Oct 30 – Nov 01
Saunders Island	Nov 28 – 30	Nov 04 – 05	Nov 13 - 14

Note: the breeding phenology of Black-browed Albatrosses at Beauchêne Island is about 10-12 days more advanced than other colonies in the Falkland Islands.

Table 3: The number of Black-browed Albatross breeding pairs counted by means of ground-based surveys at all breeding sites in the Falkland Islands, 2000-2010 (Baylis 2012a). The values for 2000 and 2005 are not consistent with Huin and Reid (2007), which included unoccupied nests in the estimates, and which have been excluded here (amounting to 34,371 in 2000, and 44,480 nests in 2005). Census method: D: Direct, P: Photographic count, T: Transect). Figures from the 2010 aerial photographs have also been included for those sites that were not counted by Falklands Conservation in 2010.

Site	**Method**	**2000**	**2005**	**2010**	**2010a**[a]	**2010b**[b]	**% change 2000-2010**	**% change 2005-2010**
Steeple Jason	D,T,P	161,704	141,690	214,203			32.47	51.18
Grand Jason	D,T[f],P	52,279	49,462	nc	89,489	89,580		
Elephant Jason	D	1,699	1,120	1,573			-7.42	40.45
South Jason	D, P	1,745	1,738	1,777			1.83	2.24
New Island	D, P	10,191	10,177	nc	14,487	15350		
North Island	D, P	17,737	20,083	24,395			37.54	21.47
Bird Island	D, P	10,189	9,990	14,048			37.87	40.62
Beauchêne Island	D,T,P	96,693	94,010	139,336			44.10	48.21
Keppel Island	D	1,869	1,623	1,735			-7.17	6.90
Saunders Island	D, P	11,004	10,740	13,053			18.62	21.54
West Point Island	D, P	14,561	13,928	nc	16,495	20352		
Grave Cove/Penguin Point	D	226	285	200			-11.50	-29.82
Total		379,897	354,846	483,887[c]	530,791[d]	535,602[e]		

a - Figures from the counts of the aerial photos taken in September /October 2010 (Strange and Strange 2011)

b - Figures from the counts of the aerial photos taken in November 2010 (Baker and Jensz 2012)

c - Missing figures from 2010 taken from the 2005 FC census estimates

d - Missing figures from 2010 taken from the September/October 2010 aerial photo counts

e - Missing figures from 2010 taken from the November 2010 aerial photo counts

f- area/density method used for some sections of Grand Jason in 2000

Table 4: Counts of Black-browed Albatross colonies (number of occupied nests) from aerial photographs (Strange 2008, Strange and Strange 2011). Photographs were taken in late September/early October (unless stated in the footnote below), at the beginning of the breeding season, to estimate the size of the potential adult breeding population.

Site	1986/87	1989/90	2005/06	2006/07	2007/08	2010/11
Grand Jason	33,711[a]		55183[d]			89,489
Steeple Jason			145,964			183,135
South Jason		950	1,550			2,189
Elephant Jason	1,164		1,302			1,822
West Point Island			13,000			16,495
Saunders Island			11,458			16,722
Beauchêne Island			108,247			105,777
New Island			13,000		13,331	14,487
North Island	15,149[b]			23,040	26,795	26,812
Grave Cove			171			456
Keppel Island			1,865			2,362
Bird Island	11,536[c]		12469[e]	15,525	15,469	15,719
TOTAL			**390,305**[f]			**475,465**

a - Photographed on 24 November. Correction factor of 1.02% applied

b - Some birds on the western side of the island may have been missed. Photographs taken on 13 October

c - Photographs taken on 13 October 1986

d - A correction factor of 1% applied to 2005/06 count for Grand Jason to account for missed area

e - A small area on the SE corner of the island was not included in the photos

f - The total figure for 2005/06 uses the estimates from the 2006/07 photos for North Island and Bird Island, as the 2006 photos provided complete coverage of the colony at Bird Island

Table 5: Counts of Black-browed Albatross populations (number of occupied nests) of part sites/study plots from aerial photographs (Strange 2008, Strange and Strange 2011). Photographs were taken in late September/early October, at the beginning of the breeding season, to estimate the size of the potential adult breeding population. See text for further details.

Site/Plot	1964/65	1983/84	1986/87	2000/01	2004/05	2005/06	2006/07	2007/08
Steeple Jason - 80%[a,b]			71,763			116,340		
Steeple Jason plot 1[b]			843			1,223		
Steeple Jason plot 2[b]			1,041			1,805		
Steeple Jason plot 3[b]			1,131			2,139		
Steeple Jason plot 4[b]			1,048			1,586		
Steeple Jason plot 5[b]			1,782			2,255		
Steeple Jason plot 6[b]			1,666			2,037		
Steeple Jason plot 7[b]			496			746		
Grand Jason plot 1[b]			548			712		
Grand Jason plot 2[b]			52			63		
Grand Jason plot 3[b]			241			475		
Grand Jason plot 4[b]			303			731		
Grand Jason plot 5[b]			364			500		
New Island South[c]				4,454	5,214	6,447	6,324	6,380
North Island (East)[d]			2,797				4,346	
Bird Island plot 1[e]			1,195				1,512	
Bird Island plot 2[e]			2,351				1,815	
Bird Island plot 3[f]			185			295	308	
Bird Island plot 4[g]						353	413	
Beauchene plot 1[h]		1,319				2,021		
Beauchene plot 2[h]		2,461				3,710		
Beauchene plot 3[h]		1,618				3,230		
Beauchene plot 4[h]		1,194				1,295		
Beauchene plot 5[h]	2,444					3,669		

a- Not all sections of the Steeple Jason colony were photographed in 1986. The entire colony was photographed in 2005, and the figure presented here (2005) is consistent with the 80% section photographed in 1986 (for comparative purposes)

b - Photos taken: 24 Nov 1986 & 25 Sept 2005. 1986 figure inflated by 1.02% - see text

c - All photos taken late Sept, except in 2000 (20 October 2000)

d - Photos taken 13 Oct 1986 & 27 Sept 2006

e - Photos taken 13 Oct 1986 & 27 Sept 2006

f - Photos taken 13 Oct 1986, 29 Sept 2005 & 27 Sept 2006

g - Photos taken 29 Sept 2005 & 27 Sept 2006

h - Photos taken: 23 Oct 1983 & 16 Sept 2005. 1983 figure inflated by 1.02% - see text

Table 6: Number of occupied Black-browed Albatross nests estimated from three different surveys in 2010: aerial photographic surveys in September/October (Strange and Strange 2011) and November (Baker and Jensz 2012), and ground-based surveys conducted in late October-November (Baylis 2012a). The percentage difference between the September/October and November aerial photographic surveys is recorded, as well as the difference in estimates obtained from the ground-based and aerial surveys in October-November.

Site	Aerial photos Sept/Oct 2010		Aerial photos Nov 2010		% difference btw Nov & Sept aerial surveys	Ground-based surveys Nov 2010		% difference btw Nov ground & aerial surveys
	Date	No. nests	Date	No. nests		Date	No. nests	
Steeple Jason	04 Oct	183,135	10 Nov	201,986	10.29	5-13 Nov	214,203	6.05
Grand Jason	04 Oct	89,489	10 Nov	89,580	0.10			
Elephant Jason	02 Oct	1,822	10 Nov	1,791	-1.70	10 Nov	1,573	-12.17
South Jason	02 Oct	2,189	10 Nov	1,996	-8.82	04 Nov	1,777	-10.97
New Island	27 Sep	14,487	10 Nov	15,350	5.96			
North Island	27 Sep	26,812	10 Nov	28,939	7.93	02 Nov	24,395	-15.70
Bird Island	27 Sep	15,719				30 Oct - 01 Nov	14,048	
Beauchêne Island	17 Sep	105,777				23-26 Oct	139,336	
Keppel Island	04 Oct	2,362				15 Nov	1,735	
Saunders Island	04 Oct	16,722				13-14 Nov	13,053	
West Point Island	04 Oct	16,495	10 Nov	20,352	23.38			
Grave Cove/Penguin Point	04 Oct	456	10 Nov	354	-22.37	18 Nov	200	-43.50